DOCUMENT RESUME

ED 348 951 IR 015 612

TITLE The Analysis of the Impact of California Educational Technology Regional and Local Assistance Programs. Summary Report.

INSTITUTION Far West Lab. for Educational Research and Development, San Francisco, Calif.

SPONS AGENCY California State Dept. of Education, Sacramento. Office of Educational Technology.

PUB DATE 20 Dec 91

NOTE 32p.; For a related report, see IR 015 614.

PUB TYPE Legal/Legislative/Regulatory Materials (090) -- Reports - Descriptive (141)

EDRS PRICE MF01/PC02 Plus Postage.

DESCRIPTORS Computer Networks; Computer Software Development; *Demonstration Programs; *Educational Technology; Educational Television; Elementary Secondary Education; *Grants; Interactive Video; Microcomputers; Multimedia Instruction; *Program Evaluation; Program Implementation; State Legislation; *State Programs; State Surveys; Statewide Planning; Telecommunications; Videotape Recordings

IDENTIFIERS *California

ABSTRACT

This report provides a brief summary of the major findings and recommendations derived from an extensive study of educational technology programs funded by the State of California since 1984 under two legislative acts, AB 803 and AB 1470. An independent evaluation of educational technology programs required by AB 1470 was conducted by The Far West Laboratory for Educational Research and Development and American Institutes for Research in 1991. The evaluation design emphasized both formative assessment of program implementation and summative assessment of educational and program outcomes. This evaluation report is expected to serve as a primary source of information for the California Planning Commission for Educational Technology in developing the California Master Plan for educational technology and to help to inform and shape future policy, planning, implementation, and evaluation of educational technology in California. Major sections of this report are: (1) Background and Overview; (2) Educational Technology Programs Funded from 1989-1991, including School-Based Educational Technology Grants, Software Development Partnerships, Level I and Level II Model Technology Schools, Instructional Television Agencies, and the California Technology Project; (3) Educational Technology Programs Funded from 1984-1989; and (4) Overall Analysis, Conclusions, and Recommendations. (ALF)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED348951

SCOPE OF INTEREST NOTICE

The ERIC Facility has assigned this document for processing to: IR

In our judgment, this document is also of interest to the Clearinghouses noted to the right. Indexing should reflect their special points of view. EA

Far West
LABORATORY

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☐ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

The Analysis of the Impact of California Educational Technology Regional and Local Assistance Programs

Summary Report

December 20, 1991

Submitted to:
California Department of Education
Office of Educational Technology
721 Capitol Mall, 3rd Floor
Sacramento, CA 95814

IR015612

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
T. Ross

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)"

BEST COPY AVAILABLE

Far West Laboratory for Educational Research and Development
730 Harrison Street, San Francisco, CA 94107-1242 (415) 565-3000

The Analysis of the Impact of California Educational Technology Regional and Local Assistance Programs

Summary Report

Project Director
John Cradler

Project Consultants
James S. Eckenrod
Lynda Greene
Vicki Lambert

Data Analysis and Desktop Publishing
Dan Cradler
Kerrie Evans

American Institutes for Research Staff
Principal Evaluator
Tom B. Parrish

Researchers
Jane Schubert
Ixtlac Duenas

December 20, 1991

Submitted to:
California Department of Education
Office of Educational Technology
721 Capitol Mall. 3rd Floor
Sacramento, CA 95814

Contents

I. Background and Overview 1

II. Educational Technology Programs Funded From 1989-1991 5

A. School-Based Educational Technology Grants 5

B. Software Development Partnerships 7

C. Level I Model Technology Schools 8

D. Level II Model Technology Schools 10

E. Instructional Television Agencies 12

F. California Technology Project 13

III. Educational Technology Programs Funded From 1984-1989 17

IV. Overall Analysis, Conclusions, and Recommendations 21

A. Overall Analysis 21

B. Recommendations 24

I. Background and Overview

This document provides a brief summary of the major findings and recommendations derived from an extensive study of educational technology programs funded by the state since 1984. The study produced: 1) a detailed descriptive study with findings, 2) an in-depth analysis report on all programs studied, and 3) a set of guidelines, templates, and evaluation instruments to be adapted for future evaluations of state and local programs and projects.

Legislative Mandate. Assembly Bill 1470 (Chapter 1334), the Farr-Morgan-Quackenbush Educational Technology Act of 1989 required an independent evaluation of educational technology programs in the state to "include procedures to standardize evaluation data collection, and strategies for the effective utilization of evaluation information to develop policy for use of educational technology." (Chapter 1334, Section 51876.5[d], Statutes of 1989) The Far West Laboratory for Educational Research and Development (FWL) subcontracting with American Institutes for Research (AIR), was competitively funded by the California Department of Education (CDE) to conduct the evaluation.

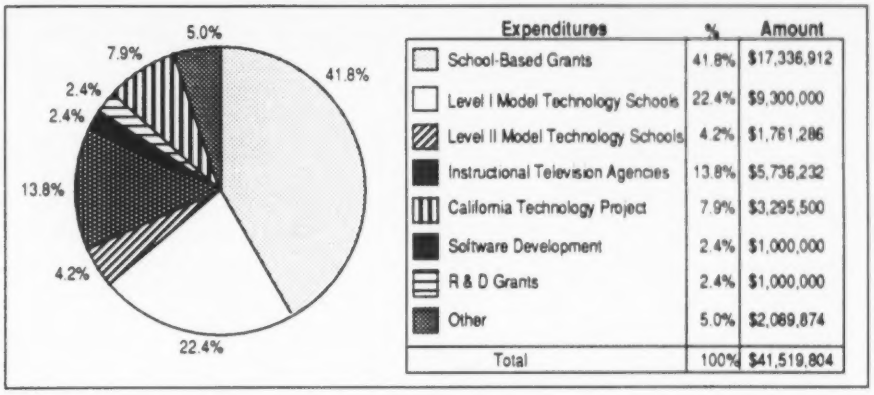
FWL was primarily responsible for the following: 1) review and analysis of educational technology programs and projects funded by the state under the provisions of AB 803; 2) intensive study of five of the six AB 1470 funded programs including the School-Based Educational Technology Grant program, the Level II Academic Model Technology School Projects, Instructional Television (ITV), the California Technology Project (CTP), and Software Development; and 3) production of evaluation templates and guidelines for all major educational technology programs. AIR was primarily responsible for the intensive study of the six Level I Model Technology Schools (MTS) Projects and a cost-benefit analysis of all six programs funded by AB 1470. The study was conducted between October of 1990 and July of 1991. The following provides a brief summary of the funding and implementation history of the programs and projects studied.

AB 803 State-wide Program Implementation. The first major funding of educational technology in California was made possible by AB 803 (Chapter 1133 Statutes of 1983), the Educational Technology Local Assistance Program initiated in 1984. In fiscal year 1984-85, AB 803 programs were allocated $15 million, with funding for 1985 and 1986 increasing to $26 million per year. In 1987 the budget was cut back to $13 million. During the life of AB 803, the Legislature provided over $80 million for a variety of programs and competitive grants to schools. AB 803 also continued the statewide network of seven regional ITV agencies, and more recently, initiated the California Technology Project (with 14 regional resource consortia). AB 803 funded the Technology in the Curriculum (TIC) projects, Computer Software and Instructional Video Clearinghouses, Software Development Projects, VCR distribution, Summer Technology Training Institutes, the Level I Model Technology Schools Projects (MTS Level I), Developmental and Dissemination Projects, the Level II Model Technology Schools Projects (MTS Level II), and several other projects. Approximately 75 percent of the AB 803 funding was allocated to school-level Adoption/Expansion Grants.

AB 1470 State-Wide Program Implementation. Subsequent to the sunset of AB 803 in 1989, AB 1470 was enacted to reauthorize some previous programs and to establish other new educational technology programs and projects. Since 1989, based on the recommendations of the Educational Technology Committee, the State Board of Education (SBE) has approved and the CDE has cumulatively allocated approximately $42 million to programs authorized by AB 1470. From 1989-1991, programs reauthorized from AB 803 include: Instructional Television Regional Agencies (including Video Program Acquisitions), the California Technology Project, Level I Model Technology Schools, Level II Model Technology Schools, Software Development Projects, and the Video and Software Clearinghouses. Newly established programs include: School-Based Educational Technology Grants (a modification of the Adoption/Expansion grants), Research and Development Projects, and other smaller contracts and projects including

the evaluation contract to FWL. The distribution of funding for the implementation of AB 1470 from 1989 to 1991 is shown in Figure 1.

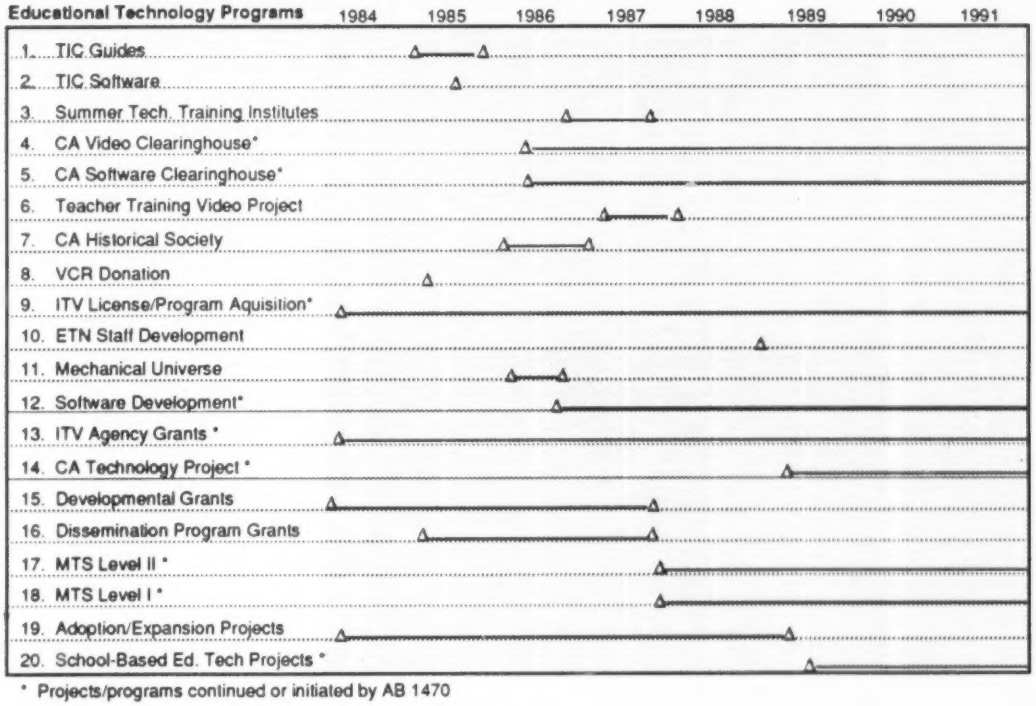
Figure 1: AB 1470 Educational Technology Expenditures from 1989-1991



Expenditures	%	Amount
School-Based Grants	41.8%	$17,336,912
Level I Model Technology Schools	22.4%	$9,300,000
Level II Model Technology Schools	4.2%	$1,761,286
Instructional Television Agencies	13.8%	$5,736,232
California Technology Project	7.9%	$3,295,500
Software Development	2.4%	$1,000,000
R & D Grants	2.4%	$1,000,000
Other	5.0%	$2,089,874
Total	100%	$41,519,804

Overview of State Funded Educational Technology Programs. When combining AB 803 and AB 1470, the State has cumulatively funded over 25 educational technology programs and projects since 1984. The combined budget for all of these programs was approximately $122 million. Figure 2 provides a listing of the 20 major programs evaluated and the approximate timeframe for their development and implementation.

Figure 2: Major Educational Technology Programs Funded from 1984-1991



* Projects/programs continued or initiated by AB 1470

The Evaluation Plan. The evaluation design emphasized both formative assessment of program implementation and summative assessment of educational and program outcomes. Multiple measures were used to facilitate corroboration of findings including surveys, interviews,

site visits, and reviews of existing reports. Every effort was made to conduct the study with consistency across projects and programs. The evaluation reports can be expected to serve as primary sources of information for the California Planning Commission for Educational Technology and the CDE in developing the state master plan for educational technology. In general, the evaluation should help to inform and shape future policy, planning, implementation, and evaluation of educational technology in California.

II. Educational Technology Programs Funded From 1989-91

This section provides a summary of findings used to answer the evaluation questions derived both from the legislation and the SBE/CDE priorities for the programs implemented under the provisions of AB 1470. For each program studied, the findings are generally related to planning, content, implementation, resources, funding, cost-benefits, and outcomes. For details about each of the projects studied, see Phase II, Volumes I-VI, of the descriptive study and the in-depth analysis report .

A. School-Based Educational Technology Grants

School-Based Educational Technology Grants are awarded to schools on a competitive basis. These one-year grants provide for a base funding level of $2,000 per school plus $25 per participating student up to a maximum of $115,000. Grants are awarded to plan and implement school-based educational technology projects to: 1) develop new technology-based programs, 2) expand existing technology-based programs, and/or 3) adopt or adapt existing validated programs such as those developed by the Level I and II Model Technology Schools. School-based projects developed with a site-based planning process serve to: increase the level of use of technology; facilitate the integration of technology into the curriculum; promote effective learning resources management; provide staff development; utilize resources provided by the CTP consortia and ITV agencies; and evaluate the impact of technology on students, staff, and programs.

Current Status/Findings: At present, approximately 600 school-based educational technology projects have been awarded to about 10 % of the schools in California. A third year of these grants will soon be competitively awarded to fund an additional 250 projects. The demand for this program is very high as evidenced by the 1,700 applicants for the first two years and approximately 1,100 applicants for the third year with 30 percent of the applicants receiving grants each year. Approximately 5.1% of the schools in California received School-Based Educational Technology Grants during 1989-90, 4.5% during 1990-91, and 4.0% during 1991-92 with a total of 13.6% of the schools in the state receiving grants. This study focused on the 321 grants funded during 1989 and implemented during the 1990-91 school year. The findings are summarized below:

Planning

- The grant application process and guidelines greatly facilitated inclusion of technology into local instructional planning and school-site plans.
- Regional agencies such as the California Technology Project, with assistance from the CDE, provided training to facilitate development of site-based Technology Use Plans.

Content

- English-Language Arts was emphasized by over 70% of the projects.
- Most projects emphasized computers with a combination of other technologies.
- Projects tended to use application software with word processing as the major emphasis, and made minimal use of content-specific educational programs.
- Close to one-third of the school-based grant recipients adopted/adapted Level II MTS projects.

Implementation and Staff Development

- Implementation of projects was generally coordinated with other school programs.
- Staff development was reported to match a broad range of staff needs.
- The staff development provided by the Level II MTS Projects was often reported as a major factor in facilitating implementation of technology to support curriculum and instruction.
- Projects developed evaluation plans which were still being implemented when this study was taking place.
- Adaptations of Level I and II models facilitated implementation and reduced re-invention of practices already developed and studied.
- Planning, learning resources management, framework utilization, staff development, coordination with school programs, and technology integration were greatly facilitated by the projects.
- Many projects set unrealistic timelines and objectives for themselves.

Support Resources

- Other than district and school staff, the CTP was the major source of assistance to School-Based Grant projects.
- The CTP and the *Self-Assessment Inventory* were the major sources of guidance for the evaluation of School-Based Grant projects.
- District office staff was the most common source of assistance; over half of the districts assigned a part-time person to assist with project implementation.

Funding Support

- AB 1470 funding was needed to initiate projects and was usually adequate, but in many cases was not extended over a long enough time-span for complete implementation.

Supporting and Impeding Factors

- School-Based projects reported that support was usually sufficient and that it was most often provided from local staff with assistance from regional agencies.
- School level implementation was often restricted by delays in equipment acquisition and lack of time to fully implement the project.
- Support from the principal, student access to technology, and staff development were critical factors in successful projects.

Cost-Benefits

- Almost all project staff reported that at least some aspects of the projects would continue with district and business partnership support after the AB 1470 funding was expended.
- Significant additional funding for project-related resources was provided by districts and a variety of other sources.
- The inclusion of technology use planning into existing school plans stimulated the use of School Improvement Program (SIP) funding for technology.

Outcomes

- The projects attained most of their intended student and staff objectives.

- There were significant increases in student academic performance and motivation reported by project staff and according to surveys of teachers and students.
- Teachers' use of technology to support the curriculum was increased.
- Teachers reported many unexpected improvements in student learning.
- Students, teachers, and administrators placed a high value on the improved access to technology resources provided by these projects.
- Though dissemination was not the focus of these projects, many developed promising practices and products with potential for application at other sites.
- Projects that reported the greatest positive outcome for students and teachers tended to report the most extensive planning for technology use.
- Many teachers reported that the lowest achieving students benefited from the introduction of technology.
- The planning, development, and implementation of school based grants greatly facilitated the infusion of technology into the curriculum
- Allocation of grant resources for the first year of the program was equitable in terms of student ethnic distribution and school size and location.

B. Software Development Partnerships

Between 1987 and 1991, seven software development partnership projects were funded by the SBE/CDE to help ensure that quality software and video programs are available to support the California Curriculum Frameworks. The TIC projects funded earlier by AB 803 helped establish the need for the software development projects by identifying areas for which exemplary programs did not exist. These matching grants were intended to provide seed money to encourage publishers to invest capital in return for guidance and support from the CDE.

Current Status/Findings: Four of the seven projects funded by AB 803 (*Explorations in Science,* Jostens Learning Corporation; *GTV,* National Geographic Society; *Science 2000,* Decision Development Corporation; and *MECC World GeoGraph*) have completed their contracts and the other three (*Exploring Matter,* C&C Software; *Adventures in Mathland,* Mindscape; and *Science and Society,* Advanced Ideas) were cancelled before completion. Although the state acknowledges that software development projects present some risk, only six percent of the nearly $1.9 million expended on software development went to the three unsuccessful projects. As part of each contract, schools in California receive substantial discounts or training, and the state receives royalties on out-of-state sales. By November 1991, the state had received over $104,000 in royalties. An eighth project, *Ancient World,* will be funded in 1991-92 by AB 1470. The findings were based on data from development reports and a limited number of user surveys.

Content

- The technology-based products developed by each of the successful projects were found to support the California Curriculum Frameworks.
- All of the projects provide adopters with staff development, teacher-support materials, or other information needed to use the programs.

Product Development

- The CDE, with limited resources, assisted in planning, developing, and marketing the products.

Evaluation

- All of the projects that were completed conducted field testing and made modifications based on student and teacher reactions to the products.

Funding and Support Factors

- Funding and support from the CDE was reported to be inconsistent among the projects.
- The software development program leveraged considerably more funds from the software publishers than had been invested by the state.

Marketing

- Four of the products are currently being marketed both in California and nationwide.
- Marketing efforts and impact have not been systematically monitored.
- Two of the products have surpassed their original sales expectations and have recovered their investment for product development.

Cost Benefits

- The investment required for a school to adopt these products varies greatly depending on the cost of the product, existing hardware resources, and whether or not purchases for other instructional materials can be replaced by the product.
- California schools receive either discounts or free training when purchasing these software products.
- The state recovers costs through royalties on out-of-state sales.

Project Outcomes

- Student ability to access and manipulate information in new and interesting ways was reported to have improved.
- The ability of teachers to integrate technology resources with the curriculum and encourage problem solving and critical thinking was improved.
- Two of the programs were used by School-Based Grant Projects and reported to be very effective.
- Teacher ratings of the educational value were generally high for all of the programs.
- Student interest and motivation were reported to be significantly improved in field-testing of the products.
- The funds stimulated the production of programs that would not otherwise be produced.
- Dialogue was opened with producers and fostered a collaborative approach to meeting schools' needs.

C. Level I Model Technology Schools

California's six Model Technology Schools Projects are funded to develop and disseminate successful practices and products to other schools and districts throughout the state. Each of the six projects has developed and is packaging information about its approaches for the application of a wide variety of technologies to K-12 education. Each project includes a research and evaluation component to determine the impact and benefits of technology applications on teaching and learning. Expected outcomes of these projects included validated models for technology planning, implementation, and assessment that can be adopted or adapted by other schools. The six projects vary greatly and range from networked labs to individualized computer

applications, include all types of technologies from ITV to multimedia, and provide a wide range of options for potential adoptions of their practices and products. These five year projects were first funded in 1987 by AB 803, with the last two years being funded by AB 1470.

Current Status/Findings: The six districts currently funded are: Alhambra City Schools (two schools), Cupertino Union Elementary and Fremont Union High (three schools from two districts collaborating on one project), Los Angeles Unified (four schools), Monterey Peninsula Unified (four schools), Hueneme Elementary (one school), and Sacramento City Unified (three schools). These projects are in their final year of funding and are concentrating their efforts on packaging and disseminating promising products and practices as well as attempting to identify sources of funding for a possible year six.

Planning

- All projects reported changes in project focus with increased emphasis on dissemination since they were initiated in 1988.
- There were increases in site-based planning to incorporate technology as a result of these projects.
- Teachers became more involved in school planning.

Content

- All projects made efforts to develop technology implementation strategies that supported the California Curriculum Frameworks.
- Alignment with the Frameworks could have been improved with greater involvement of the Subject Matter Professional Development Projects and CDE curriculum staff.

Implementation

- All six projects completed most planned development activities but did not fully implement dissemination activities.
- The degree of coordination with other regional and state programs varied considerably by project site. At most sites the program was well coordinated with the overall local school program.
- Prior commitment to and involvement with technology facilitated implementation of MTS activities.
- The most successful projects received active assistance from district, school, and project-management staff.
- All of the projects showed evidence of attempting to respond to CDE goals and initiatives.
- Staff development was generally adequate but sometimes not relevant to direct classroom applications.
- Standards and expectations for Level I project implementation were reported to be unclear and subject to change from year to year.
- At least 5,000 educators have visited the MTS projects.

Support Resources

- Projects reported receiving varied levels of assistance from the CTP and ITV agencies.

Funding Support

- Use of funds varied greatly across the projects according to local planning and focus.

- AB1470 funds did not constitute total revenues for technology expenditures at any of the projects for the 1989/90 year as projects obtained other supplementary revenue sources.

Cost Benefits

- A future cost/benefit will be that districts which adopt MTS programs will save planning and development costs.
- Costs per pupil to develop and implement projects ranged from $45 per student in the Los Angeles MTS to $600 per student in the Port Hueneme MTS project.
- A cost-benefit was the significant level of funding the projects attracted from business and host agencies.
- All sites engaged in varied dissemination activities within the project schools, within the project districts, to other districts in the state, and in some instances outside the state.

Outcomes

- Although test results were mixed and sources of student performance information varied, all sites reported substantial gains in student performance.
- All sites reported important changes in instructional practices as resulting from the advent of technology at the school.
- All MTS sites reported some form of increase in parent/home involvement.
- All projects established business partnerships with donations reported between $40,000 and $300,000 in 1989-90.
- The vast majority of participating teachers and administrators reported that they valued this technology program.
- Access to project participation was generally open to teachers and administrators in participating sites and the projects were well distributed statewide to schools with broad ranges of ethnic minorities and special student populations.
- Effective teaching and curriculum were generally found to be a prerequisite for the effective use of technology.
- Effective practices for the management of learning resources were developed by all projects.

D. Level II Model Technology Schools

The Level II Model Technology Schools (MTS) program was initiated in April of 1987 when the CDE competitively awarded AB 803 grants to ten school districts to develop and validate projects that would integrate technology within a single curriculum area at specific grade levels at a school site. Funding for six project sites was continued under AB 1470 to package and disseminate the programs throughout the state so that other schools could adopt or adapt the models.

Current Status/Findings: The six projects currently funded are: Project LINKS (elementary English-language arts), Project FUTURE (middle school English-language arts), Project HAT (middle school history-social science), Project TIME (high school history-social science), Project TOPS (elementary science), and Project TASC II (middle school science). A seventh project, focused on mathematics for grades K-6, was recently added for dissemination during 1991-92, but is not included in this report.

Planning, Content and Implementation

- The planning and development of Level II MTS projects established models for the infusion of technology into the implementation of the California Curriculum Frameworks, and in some cases, actively involved the California Subject Matter Professional Development Projects.
- Most projects emphasized computer use along with some applications of other technologies in laboratory settings to integrate technology into the curriculum.
- Technology integration greatly expanded instruction, particularly emphasizing a shift from teacher-directed to student-centered instruction and cooperative learning.
- Each project provided staff development to match a broad range of staff needs both during implementation of the project and on an on-going basis.
- Collaboration with other programs and agencies and other Level II MTS projects was consistently reported as frequent and beneficial.
- Evaluation activities were implemented on a limited basis due to lack of guidelines and resources.
- While the allocation of funds to all six Level II Model Technology Schools was equitable, some curriculum areas and grade levels were not funded.

Dissemination

- Level II Projects provided widespread dissemination of information about the projects through brochures, traveling seminars, conferences and workshops.
- The six Level II MTS schools were able to provide direct technical assistance specific to integrating technology into instructional programs on a varied and generally limited basis.
- About one-third of the School-Based Educational Technology projects adopted or adapted Level II projects.
- Most adopters of Level II projects (80%) were School-Based Grant recipients.
- All Level II project directors stated that additional assistance was needed from the CDE and CTP in order to effectively market their projects' programs and practices to other schools.

Supporting and Impeding Factors

- A major equipment and software donation valued at $500,000 was received from IBM.
- Varied levels of assistance were provided to the MTS Level II projects by the CDE, CTP, and ITV agencies.
- Funding from the CDE with assistance and in-kind support from the host districts were major supporting factors.
- Lack of time, unpredictable funding, and inconsistent guidelines for dissemination planning were major resource deficiencies.
- Two projects participated in collaborative work with the California Subject Matter Professional Development Projects.

Cost-Benefits

- The Level II MTS projects generally provide cost-effective models for schools to use in integrating technology into the curriculum.
- Most adopters report that being able to adopt a model that has been field-tested saves time and development funding.

- Projects were able to match the funding provided by the state through in-kind support from districts and business/industry.

Outcomes

- Improved student attitude, interest, academic performance, and technology use were consistently reported to be direct and indirect effects of the projects.
- A variety of changes in teaching and instructional approaches at Level II Project sites were reported such as project-influenced increased technology use beyond the scope of the project.
- The participating project directors and almost all of the teachers expressed a great deal of enthusiasm about the accomplishments of the projects.
- Over 170 schools are reported to have adopted or adapted Level II MTS project practices and/or products.

E. Instructional Television Agencies

Instructional video and related support services are provided for schools in California by regional Instructional Television (ITV) agencies. The agencies work in conjunction with the CDE's Office of Educational Technology and the media and technology staff in the counties and districts served. Financial support for ITV agencies is provided through AB 1470 with additional support from county offices of education, local districts, public television stations and in some cases, membership fees. Instructional video programming is selected by committees representing schools and local education agencies. The ITV agencies also play a major role in the evaluation and distribution of ITV programming and in staff development programs on video resources throughout the state.

Current Status/Findings: The seven ITV agencies currently funded by AB 1470 include: the Northern Instructional Television Advisory Council (NITAC), KQED-ITV, Santa Clara County EMC-ITV, the Regional Educational Television Advisory Council (RETAC), Los Angeles Unified School District (KLCS), Telecommunication of Orange County (TOC-KOCE), and the San Diego County Office of Education. Several of the ITV agencies are expanding their emphasis to include distance learning, multimedia, and video teleconferencing.

Planning, Content, and Implementation

- There is considerable variation among the ITV agencies in their capability to assess the needs of schools for instructional television programming and support services.
- The two largest ITV agencies are able to allocate resources to develop school resource materials on using instructional video to align instruction with the state curriculum frameworks.
- About one-third of the educational media center directors stated that video tape distribution was more practical in terms of scheduling than broadcast.

Funding Resources and Constraints

- There is considerable variation among the regional ITV agencies in the proportion of their operating budgets provided by the state ITV grants, membership fees, and local agencies.
- Some agencies lack the local resources and broadcast facilities needed for optimal access to ITV by schools in their regions.

Cost-Benefits

- Most ITV agencies were able to leverage significant levels of in-kind support, donations, and/or membership income.
- The cost of supplemental instruction provided via ITV and video is often an inexpensive and effective supplement to the instructional program.

Outcomes

- ITV agencies provide a valuable service by informing and training educators in the selection and use of instructional video.
- Most schools and districts include ITV within their instructional programs.
- State funded ITV agencies help compensate for the unequal access to ITV support services of schools in different parts of the state.
- Many teachers are often unaware of the extent to which the ITV resources they receive are provided by an ITV agency since the resources may flow through the county or district media center.

F. California Technology Project

The California Technology Project (CTP) consists of 14 Regional Consortia coordinated by a Central CTP Office. The CTP was initiated in 1988 with AB 803 funding and continues to be funded under the provisions of AB 1470. The major statewide CTP activities fall into four categories: statewide leadership and support for the regional consortia, information collection, information dissemination, and staff development. The Central CTP supports and provides quality control for the regional consortia, overseeing the development of their by-laws, budgets, governance, and programs. The major functions of the 14 Regional Consortia are to: 1) provide staff development for integrating technology; 2) assist in AB 1470 project development, implementation, and evaluation; 3) coordinate resources for technology use; 4) facilitate the use of the *Technology Resources In Education* (TRIE) information service on CSUNet; and 5) provide individualized technical assistance to the schools served. Their regional lines roughly follow county lines, but, in some cases, overlap. Most often, they serve multiple counties. The CTP regional consortia are member driven with services determined by local needs.

Current Status/Findings: The CTP continues to provide support with increased collaboration with other regional agencies such as the SB 1882 Staff Development Consortia and County Offices of Education. The CTP recently assisted the CDE in reviewing the third year of AB 1470 School-Based Educational Technology grant applications. The following are findings from the study of consortia activities from 1988 to 1991:

Planning and Implementation

- The CTP consortia engage in planning procedures that are based on client needs ascertained through formal needs assessments, informal contact, and the consortia Council and/or planning committee.
- All of the regional consortia addressed CDE priorities related to local needs.
- The CTP system was the prime delivery system for information about the school-based grants which catalyzed focused planning at school sites throughout the state.
- Despite limited resources, the CTP continues to meet most of its objectives.
- Both the Central CTP and the regional consortia conduct programs emphasizing integration of technology into the curriculum and instructional planning.

- All of the CTP consortia provide staff development which was generally well received.
- Almost all CTP activities were implemented as planned.
- The CTP consortia provided assistance and disseminated products and practices of the Level II MTS projects.
- Most staff time was allocated for planning, management, and staff development activities.

Marketing

- The CTP employed a variety of marketing tools to promote its services and to disseminate information. The user survey indicated a high level of awareness of services available to CTP members.
- The CTP relied on brochures, newsletters, and catalogs as well as personal contact to market services.
- Most school-based grant recipients were aware of CTP agencies and services offered.

Resources

- The CTP consortia received state grants as seed money and relied heavily on their host agencies for in-kind support.
- There was a great deal of coordination with the host agencies in both planning and delivery of services.
- The Central CTP contributed to the management of learning resources through their information collection and dissemination efforts.
- Business and industry collaborators were particularly supportive with donations of services, facilities, equipment, and trainers.
- The CDE Office of Educational Technology provided assistance to the CTPs to the extent possible given budget constraints.
- The major facilitating factor was the support provided by the host agencies and the Central CTP.
- Major impediments to CTP implementation were size of regions, travel distance, and a shortage of funding.

Cost Benefits

- For every state dollar invested in the CTP consortia, an additional dollar was provided by the local host agency and/or business/industry.
- CTP coordinators and clients consistently report that the CTP is a cost-effective investment with a large payoff in services.

Outcomes

- Clients relied heavily on the CTP consortia for assistance in planning for technology integration through the Teacher Leadership Academies and other workshops.
- CTP resources greatly facilitated the inclusion of technology into local instructional planning and school site plans.
- The CTP was a major source of assistance to schools developing AB 1470 School-Based Educational Technology projects.
- Both teachers and administrators who use the CTP resources and services placed a high value on such resources and services.

- Though usage is gradually increasing and services are being improved, TRIE has not achieved its potential for use due to lack of access, relevant content, and ease of use.
- Internal evaluation practices varied among the regional consortia.
- Over two-thirds of school-based grant recipients attended CTP evaluation workshops, and all received a CTP evaluation handbook.

III. Educational Technology Programs Funded From 1984-89

The following provides a brief summary of programs funded from 1984-1989 under the provisions of AB 803 with a summary statement of the current status/findings included for each program. Detailed descriptions of these programs are provided in Phase II, Volume I of the study.

A. Technology in the Curriculum (TIC) Guides

The TIC project was funded during fiscal years 1985-86 and 1986-87 to match computer software and video programs with the curriculum, and to produce and distribute resource guides describing these programs. Projects for each major subject area identified exemplary programs that supported the curriculum frameworks, and prepared model lesson and unit plans that demonstrated how to integrate technology within the curriculum.

Current Status/Findings: The print versions of the TIC resources guides have not been revised since 1989. However, the Software and Video Clearinghouses provide similar information through the Technology Resources in Education (TRIE) information service on CSUNet. Evaluations indicate the TIC guides are valued by those who use them but that relatively few educators are aware of their existence.

B. Technology in the Curriculum (TIC) Software Distribution

The CDE purchased and distributed sets of exemplary software to all schools in the state along with the TIC resource guides. These exemplary rated programs were included with the sample lesson plans accompanying the TIC documents. Schools were required to send at least one teacher to a brief training session in order to receive the software.

Current Status/Findings: This was a one-time distribution, conducted in the Spring of 1986. The impact of the distribution was not assessed, but it was expected to promote use of the guides and to provide models of exemplary software.

C. Summer Technology Training Institutes

During 1986 and 1987, the CDE funded nine four-week summer institutes to train regional teams of teachers. The program provided intensive staff development to approximately 1,200 teachers and other educators in the use of technology in the curriculum. A "training of trainers" model was featured whereby teachers became technology resources for their schools and/or districts after completing the institutes and were then available to provide local staff development and assistance.

Current Status/Findings: The summer institute program was not continued under AB 1470, however, the CTP regional consortia conduct Technology Leadership Academies which focus on the integration of technology into specific curriculum areas. The Summer Institute Project helped to integrate the resources available from other state-supported projects, such as the Curriculum Implementation Centers (CICs), the Teacher Education and Computer Centers (TECCs), the Mentor Teacher Program, the TIC Projects, and the California Subject Matter Professional Development Projects. The responses to a telephone survey of teachers who had attended the institutes were exceptionally positive. Most stated that the intensive staff development was highly useful, and they expressed interest in attending future institutes.

D. California Instructional Video Clearinghouse and California Computer Software Clearinghouse

The California Instructional Video Clearinghouse, located at the Stanislaus County Office of Education, was established in 1986 to coordinate the evaluation of video programs and to disseminate information about high-quality programming throughout the state. The Computer Software Clearinghouse evolved from the Teacher Education and Computing Center (TECC) Software Library at the San Mateo County Office of Education and is responsible for coordinating the evaluation of educational computer software and disseminating information about high-quality software throughout the state. The Software Clearinghouse is currently located at California State University, Long Beach, and represents California in the national *Educational Software Preview Guide* project.

Current Status/Findings: Both Clearinghouses now collaborate in the ongoing standards-based evaluation of multi-media programs which involve both computer and video technologies. Information on exemplary computer and video programs is now available in the TRIE electronic database that can be accessed statewide through CSUNet. Indications are that these Clearinghouses provide a valuable service that must be promoted, made more accessible, and must be more closely coordinated with the California Subject Matter Professional Development Projects and regional staff development agencies.

E. Teaching Video Pilot Program

The Teaching Video Pilot Program (TVPP) was made possible by special legislation, SB 2130, to fund the production of teacher-produced instructional videos for classroom use. During 1987, the successful bidder on the TVPP project, the Sacramento Educational Cable Consortium (SECC), produced 125 instructional videotapes.

Current Status/Findings: Information on this one-time pilot project was disseminated to county media directors. The value to students and actual level of statewide use is largely undetermined. However, the project showed that given time, training, and equipment, teachers could produce video programs to support instruction. The TVPP leveraged significant outside resources from business foundations and institutions of higher education.

F. California Historical Society *On Location* Video Programs

In 1987, the CDE awarded a grant to the California Historical Society to produce a series of ITV programs with teacher's guides designed to support the fourth grade history-social science curriculum. The California Historical Society augmented the grant with $193,000. The programs reflected the cultural diversity of California and covered topics which are not emphasized or even covered in textbooks.

Current Status/Findings: Four programs were produced which are currently available to educators. The programs serve an important need but are of limited quality due to a low budget for development and production.

G. VCR Distribution

During the Fall of 1985, the CDE distributed a videocassette recorder to each public school in California. To receive the VCRs, schools were required to send a representative to a brief workshop covering basic VCR operation, curriculum integration, ITV resources, and copyright law.

Current Status/Findings: This project was reported to have stimulated increased use of instructional video and ITV and served as an incentive for educators to learn about other

applications of technology to enhance learning. Schools collectively saved over $1 million through this group purchase of equipment.

H. ITV Licensing

In 1982, the CDE established a program to acquire multi-year licenses from the producers and distributors of ITV series for the rights to broadcast and distribute the series to schools in the state. The directors of the seven ITV agencies, with input from county media directors and subject area consultants, review and make recommendations to the CDE for statewide licensing of ITV programs. For the past ten years, the state has funded licensing at approximately $200,000 per year.

Current Status/Findings: ITV licensing is an ongoing program that is currently funded by AB 1470. The program provides a major cost-saving while increasing access to generally high quality programming. The level of use of the programs has not been systematically evaluated.

I. Educational Telecommunications Network (ETN) Staff Development Program

In 1989, the CDE provided funding to the Educational Telecommunications Network (ETN) at the Los Angeles County Office of Education (LACOE) to produce a series of programs on how to implement the California State Curriculum Frameworks. The programs were broadcast in 1990 over the ETN satellite network.

Current Status/Findings: The programs were not systematically evaluated and anecdotal reports indicated a lack of depth and quality. Since the time of the contract to produce these programs, ETN, which does not receive state funding, has greatly expanded its use as a vehicle for the satellite delivery of staff development and instruction within California and across the country.

J. California Mechanical Universe Model

The California Mechanical Universe Model was a collaborative project developed and implemented by California Institute of Technology, the California State University, and the CDE. The intent of the project was to provide inexperienced high school physics teachers with training on the use of the *Mechanical Universe* video series and other demonstration aids.

Current Status/Findings: The program was reported to be of high value in upgrading teacher skills in teaching physics, and *The Mechanical Universe* continues to be widely used in California Community Colleges.

K. Developmental Grants Program

Several Developmental Projects were funded by the CDE between 1984 and 1987 to develop and validate models for technology use that could be disseminated to other schools in the state. Several projects were developed and competitively funded for about two years and then abruptly terminated due to cuts of state funds. It was intended that projects which developed effective products and practices would apply for dissemination grants.

Current Status/Findings: In many ways developmental projects were continued as the developmental phase of the Level II MTS, software development projects, and now the R&D projects. Survey and interview results suggest that incentives for R&D must continue in order to validate new and emerging technologies for education.

L. Dissemination Grants Program

Dissemination grants were competitively awarded to several earlier educational technology developmental projects (which had been funded under the educational technology legislation in effect before AB 803). These projects provided information, dissemination, and training to establish adoptions on a statewide basis. The dissemination program funded 11 projects in 1985-86, and 10 in 1986-87. Projects prepared and distributed materials for students and teachers, hosted visitations, made presentations at conferences, trained staff at the regional TEC Centers, conducted follow-up technical assistance, and sometimes evaluated the adoption of their practices and products.

Current Status/Findings: Funding was terminated in July 1987. However, dissemination programs continue for the Level I and Level II Model Technology Schools. Available information suggests that the Dissemination Grants Program was successful and a benefit to many schools across the state. Many AB 803 Adoption/Expansion Grants funded adoptions and adaptations of the 10 dissemination grant projects.

M. Adoption/Expansion Grant Program

The AB 803 Adoption/Expansion Grant Program provided relatively small grants to schools for projects that utilized technology to support instruction. The projects typically funded were software and hardware acquisition combined with the needed staff development. Schools were encouraged to plan for curriculum integration and to provide staff development. The TEC Centers provided local administration of these grants and provided staff development and technical assistance to the grant developers and recipients.

Current Status/Findings: The Adoption/Expansion Grant Program was operated from 1984-88 and funded 5,638 school sites (79% of California schools). The Adoption/Expansion grants were terminated with the sunset of AB 803. However, many of the most effective aspects of the program were continued within the School-Based Educational Technology Grant program subsequently authorized by AB 1470. The Adoption/Expansion projects significantly increased access to technology and increased the number of computers in schools by 40 percent. These grants served to empower many educators to initiate and expand technology use and to leverage new funding for technology. Most of the Level I and Level II Model Technology School projects were initially stimulated by Adoption/Expansion grants. The demand for school level grants far exceeded what could be made possible with available funding (which was greater in 1985-87 than what is currently available for similar school-based grants). Funding was not made available specifically for the on-going evaluation of the impact of the program.

IV. Overall Analysis, Conclusions, and Recommendations

A. Overall Analysis

Since 1984 the major goal of the state's educational technology program has been to enhance the classroom implementation of the state's curriculum frameworks with the aid of technology. The CDE and the Educational Technology Committee, with input from educators, has conceptualized and implemented over 25 educational technology programs and projects, each with a direct or indirect emphasis on curriculum implementation. To further this aim, the CDE and the Legislature have strongly emphasized program elements to include school and district technology use planning, staff development for effective implementation, targeted and effective management of educational resources, and evaluation of the benefits of technology programs. The following analysis summarizes the relative influence that the six programs, which were studied in-depth, exerted on the state's educational initiatives.

Regional Support Services. The CTP, ITV agencies, and CDE provide statewide regional support for the dissemination of information, technology based resources, and services to assist county, district, and school level implementation of technology.

California Technology Project: The CTP served to carry out the initial implementation of state initiatives by linking the state to the local projects with project-development training that included technology use planning, curriculum integration through Technology Leadership Academies (TLAs), and evaluation training. The CTP provides follow-up assistance to projects for implementation and evaluation while linking them to the Technology in the Curriculum resources listed in the TRIE database. The Technology Leadership Academies (TLAs) provide intensive training in the integration of technology with the curriculum.

Instructional Television: The ITV agencies indirectly support the CDE initiatives by assisting schools in selecting and using ITV programming that supports and implements the frameworks and by providing printed materials to guide teachers in the integration of video programs with the curriculum. ITV agencies support development and implementation of School-Based Educational Technology Grants with the support of ITV resources. The ITV agencies also implemented their own plans that reflect the CDE initiatives and are reviewing ways to better integrate ITV resources with existing delivery systems.

Resource Development. The MTS Level I and II, software development projects, and more recently, the Innovative Research and Development projects provide a source of new technology-based resources for adoption and use by schools and districts. The regional support agencies help disseminate these resources to the local educational agencies.

Model Technology Schools Level I and II: Level I MTS projects emphasize school and district-wide planning models by demonstrating methods for managing and directing learning resources that support the planned integration of technology. These projects help guide schools in the use of technology to support school-based planning for technology, effective management of resources with the aid of technology, and the use of technology to directly enhance the curriculum. The Level II MTS projects provide

support for the targeted implementation of frameworks by directly assisting schools to adopt framework-based technology applications in specific subject areas.

Software Development Projects: These projects are the most specialized in that they focus on the development of innovative technology-based materials to cover specific curriculum framework areas and to provide models in order to encourage developers and publishers to produce similar high quality technology-based instructional materials. The intention of these projects is to use technology to provide more effective and interesting delivery of instruction to students in ways not possible with printed material.

School-Based Technology Planning and Implementation. The School-Based Educational Technology Grants have provided a major resource to stimulate technology planning and implementation in California schools.

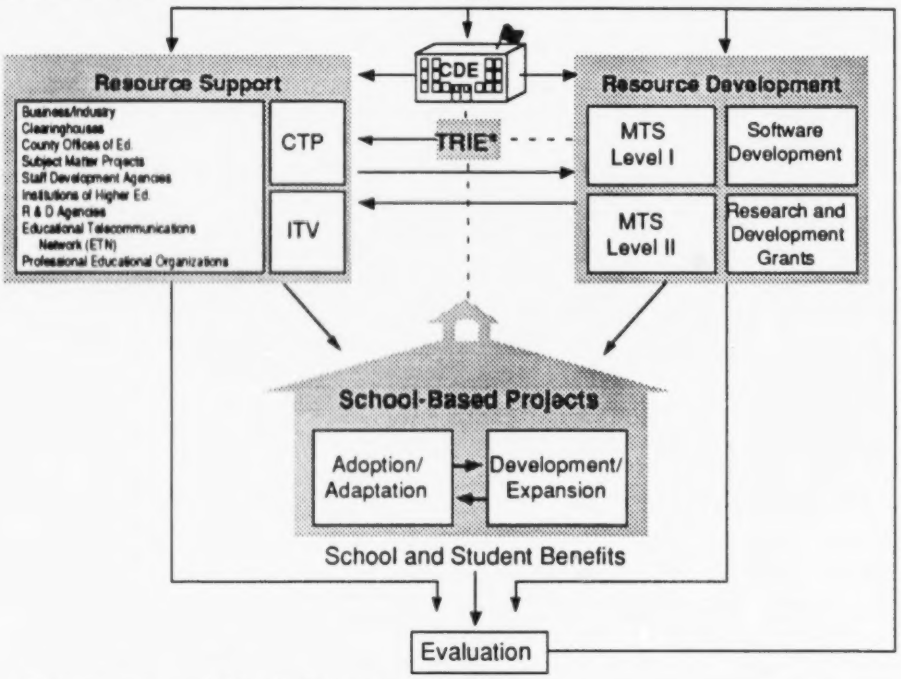
School-Based Educational Technology Programs: The School-Based Educational Technology projects played a major role in stimulating site-based planning for technology use as was suggested by the Legislature and the CDE. Along with this planning was the incorporation of technology into curriculum and instruction. Staff development was greatly emphasized, and evaluation was implemented in most projects. The School-Based Projects evidenced much promise in producing technology use planning and curriculum integration. However, more project implementation time is needed to adequately assess impact on teaching and learning.

This study clearly shows that the guidelines, combined with the funding incentives and interests stimulated by technology, influenced implementation of the state's initiatives with School-Based Educational Technology projects. The influence of the School-Based projects would have been minimal or non-existent without the support of the CDE Office of Educational Technology ensuring that the guidelines were well defined and put into operation by the CTP with support from the ITV agencies and Model Technology Schools.

Generally, all of the technology programs support and enhance each other with the common goal of improving curriculum instruction and learning in ways to increase benefits to students. Evaluation findings on the individual and collective influence of these programs will serve to inform program stakeholders on ways to increase the benefits of the educational technology programs, projects, and initiatives for students.

Figure 3 illustrates the organization and inter-relationship of the programs and projects funded under AB 1470. This model suggests some important elements that should be considered in future planning for an educational technology program.

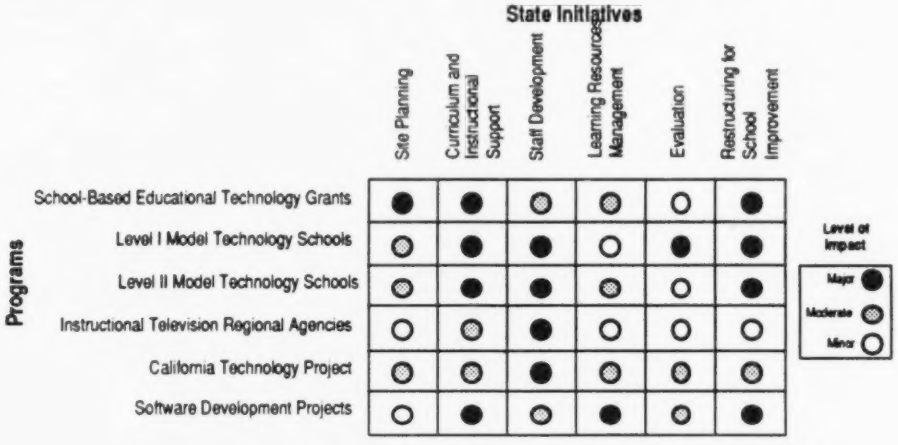
Figure 3. Educational Technology Programs Funded by AB 1470: Resource Support and Resource Development to Support School-Based Projects



*Technology Resources in Education Telecommunications Service

Initiatives that have been consistently identified for emphasis by educational technology programs include site planning, curriculum support, staff development, learning resources management, evaluation, and restructuring for school improvement. Figure 4 shows the impact of each program on initiatives as determined by the data and information collected in the study. These initiatives served as the guiding principles for the planning, implementation, and evaluation of technology programs as described in the provisions of AB 1470.

Figure 4. Educational Technology Projects and Their Relative Level of Impact on Major State Initiatives Directed Towards School Sites



In general, all of the programs funded by AB 1470 have varied approaches to facilitating the planned use of technology to augment and support the state curriculum frameworks. The results of this study indicate that while all programs support the state's instructional improvement objectives, much can be done to improve this effort. Implementing recommendations in this report will help to increase the collective and individual impact of the state's educational technology initiatives.

Conclusion. This study has helped to identify important and effective technology practices, products, and resources which have evolved from state funded educational technology programs and projects since 1984. These programs and projects have cumulatively resulted in much that should be considered for continuation in the future. The external pressure for schools to restructure, reform, or "break the mold" should not give rise to the arbitrary decision to abandon and discontinue the successful programs and practices that have been developed. Restructuring should look at more effective ways to use and make available the promising practices, products, and resources made possible by the implementation of programs and projects funded and guided by AB 803 and AB 1470.

B. Recommendations

The independent study of educational technology programs and projects funded by the state from 1984-1991 shows that much has been accomplished with limited funding and that these limited state funds have leveraged significant levels of in-kind public and corporate resources. Additionally, the study has evoked general and specific recommendations for increasing the access to and impact of technology in California education.

Many of the recommendations for improving the quality of programs, equity of technology access, impact on students, management of resources, and accountability of the state educational programs will require a significant increase in state funding. Funding for educational technology since 1987 has been less than half of what it was in prior years, and schools lack the support of previously funded programs such as the Teacher Education and Computing Centers. Additionally, funding for educational technology is presently less for California than it is for most other states. To implement these recommendations it will be necessary to provide substantial and sustained funding.

The following recommendations are based on the analysis of the data and information collected directly from the stakeholders, project records, and the many other sources cited in the intensive study of programs funded from 1989-1992 by AB 1470, as well as the review of programs funded by AB 803 from 1984-1989.

Recommendations for Areas of Emphasis

This study shows that several areas of emphasis should be considered in developing and implementing a new educational technology initiative. They are summarized as follows:

1. *Access to technology-based resources:* All programs, projects, and initiatives should ensure that all students and educators are provided with access to necessary facilities, technology-based instructional materials, hardware, and training. Sufficient funding must be made available to enable schools to obtain technology-based resources to improve teaching and learning.

2. *Technology Use Planning:* Careful planning for technology implementation should be coordinated with existing programs and should be emphasized not only at the site level, but should also be emphasized at the district, regional, and state level.

3. *Professional Development:* Technology-based pre-service and in-service training for teachers, which is relevant to current instructional needs and which includes use of the many resources developed with AB 803 and AB 1470, should be a major emphasis and should be linked to the state's curriculum framework implementation efforts.

4. *Curriculum and Instruction Integration:* Educational technology programs, projects, and initiatives should be curriculum-driven and integrated into existing and new instructional programs to include the State Curriculum Frameworks as well as state guidelines for vocational education, special education, bilingual and migrant education, and all other programs as appropriate.

5. *Accountability:* Assessment of both program implementation and outcomes should be a continued emphasis. Such assessment should be based on established state and coordinated local standards for instructional improvement and technology use, and the results should be reported and disseminated to stakeholders throughout the state.

6. *Coordination of Resources:* Development, implementation, and dissemination of technology programs should be coordinated with existing programs within and among schools, districts, regional agencies, state agencies (e.g. higher education and health and welfare), and between units, divisions, and branches in the California Department of Education.

7. *Development, Research, and Dissemination:* To keep pace with rapidly emerging new technologies, educators must have opportunities, in collaboration with researchers and developers, to develop, validate, and share promising technology-based products and practices that improve instruction for students.

8. *State-wide and National Information Access:* New projects and programs should tie into and support the development and use of an interactive telecommunication network that includes voice, data, and video and that serves to link educators to state, national, and international information about education and technology resources.

9. *Business and Community Partnerships:* Collaboration with business and industry, higher education, and community agencies should be emphasized in the development, implementation, and dissemination of educational technology projects, programs, and initiatives.

Recommendations for Implementation

The following recommendations are derived from the aggregated findings of the study and should be considered when redesigning current programs and when developing new educational technology programs and initiatives in California. The recommendations fall into the categories of *State-wide Technology Information and Resources Management; Resource Development and Dissemination*; *Regional Services to Schools*; and *School and District Level Resources*.

A. Statewide Technology Information and Resources Management

1. *Representative Governance Structure:* Provide for an Educational Technology Council which represents appropriate agencies and organizations, with adequate resources, to

ensure that educators from pre-school through post-secondary education, with active participation of business and industry, are collaboratively involved in ongoing statewide planning and implementation of educational technology programs and initiatives.

2. *State Planning:* The California Educational Technology Master Plan, to be produced by the California Planning Commission for Educational Technology, should be implemented in concert with state-level planning for technology, based on established needs, and coordinated with other educational programs, agencies, and initiatives.

3. *State-wide Program and Project Standards:* The CDE should establish clearly stated guidelines with standards for development, implementation, evaluation, and dissemination of programs and projects. Such guidelines and standards should be the basis for the implementation and evaluation of programs. The guidelines and standards should be reviewed annually by the CDE and the Educational Technology Committee and other advisory or governing bodies and be adjusted according to educational needs and trends for the state.

4. *Licensing of Technology-Based Materials:* State-wide licensing of instructional video programs should be: 1) continued with increased funding and greater involvement of teachers, subject matter specialists, ITV agency staff, and media directors, and 2) combined with ongoing assessment of the use and impact of programs on teaching and learning. State licensing should also include appropriate video teleconferencing and distance education programs.

5. *Telecommunication and Distance Learning:* Expand and modify the current telecommunications systems to become a statewide coordinated, user friendly, and cost effective system that provides timely and relevant information for use by educators and other education stakeholders. Consider the establishment of a centralized agency to 'broker' and coordinate the access and use by educational agencies of the various telecommunications systems including the various satellite video uplinks and public and private voice, video, and data telecommunications systems.

6. *Assessment and Evaluation:* Continue the emphasis on assessment of program and project development, dissemination, and impact, and make assessment and evaluation design part of initial planning and development. The CDE should develop and implement clearly defined standards and expectations with proposed instrumentation for assessment of all programs and projects. The CDE should establish guidelines to use "alternative assessment" methodologies appropriate for the evaluation of educational technology programs and projects. R & D should be conducted to validate ways that technology can be used as a tool to assist in the performance assessment of students and to monitor and assist the reporting of the results of performance-based assessment programs.

7. *Use of Assessment Findings:* The CDE should continuously collect and report findings about desired practices and products that emerge from the state supported programs. Evaluation information from various program and project reports and other studies including the Level I MTS research findings should be used to help guide the state in program planning and development decisions.

8. *Technology in the California Curriculum Frameworks:* The State Board of Education should adopt standards to ensure that appropriate technology applications are integrated into the existing and new state frameworks. This would facilitate increased technology access by providing the rationale and incentive for schools and districts to purchase and implement educational technology. This technology integration would prompt the new

student assessment systems to include technology in assessment tasks which would also result in increased use of technology in curriculum and instruction.

9. *Quality Indicators:* The program quality indicators used for the School Improvement Program should be revised to encourage technology integration in the curriculum. New Program Quality Review guidelines should include "exemplars" for the effective use of technology to enhance and improve teaching and learning.

10. *Technology Integration Among State Programs:* The technology projects assessed in this study have been held accountable by the CDE's Office of Educational Technology for ensuring that their focus is the integration of technology into the curriculum. In order to fully realize this goal, other state programs and projects, such as the California Subject Matter Professional Development Projects should emphasize the effective use of technology in their programs. Similarly, most other offices and divisions within the CDE, especially those with responsibility for curriculum, instruction, and assessment should address the goal of technology integration.

B. Resource Development and Dissemination

1. *Standards for Resource Development:* Establish and implement clearly defined criteria and standards for development, evaluation, and dissemination of programs. The state should periodically review and certify programs and practices to be included in the central database as exemplars for possible adoption/adaptation by school sites. Funding priorities for these programs should be guided by student and teacher needs as well as by emerging state and national educational trends.

2. *Research and Development Projects:* Continue funding and other incentives for Research and Development Projects to provide for the development and validation of 'cutting-edge' educational uses of technology in an effort to provide educators with up-to-date and replicable products and practices that can easily be adopted or adapted. This recommendation is supported by the finding that the Model Technology Schools Projects were a critical resource to schools seeking models and promising practices to adopt or adapt.

3. *Technology-Based Materials Development:* Make systematic and coordinated efforts to develop exemplary instructional video, multi-media, and other technology-based programs to serve local and statewide needs. Continue to offer incentives to publishers for the development of exemplary technology-based materials to support the state curriculum frameworks that meet the requirements of the instructional materials adoption process. Incentives should be shifted from reliance on state funding to the state providing seed money with developers providing at least a 100 percent match of the state's funds. The percentage of the developer's match could be increased as the state provides other incentives, such as the selection of the materials for state adoption and active assistance in evaluation, marketing, training, and dissemination of exemplary products. Schools should be encouraged to use their textbook funds for state-adopted technology-based materials.

4. *Distance Learning and Staff Development:* Review existing distance learning resources in California and develop a coordinated distance learning system for the state to focus on the needs of rural and small school districts as well as urban and suburban districts. Consider funding the establishment of a statewide video teleconferencing system for use by the CDE and the various staff development providers to deliver in-service and pre-service across the state.

5. *Model Technology Schools:* Ensure that effective aspects of Level I MTS Projects already in place are carefully considered in developing new initiatives and programs build upon the considerable state, school, and district investment already made in the models. The Level I MTS projects have produced many products and practices that should be shared and built upon. Grants should be provided for the dissemination of specific MTS promising practices and products and could include: staff development institutes, research on new products, assistance to districts in developing adaptations of specific programs and practices, training for administrative uses of technology, and others.

6. *Dissemination Projects:* Continue to fund the dissemination of projects that focus on specific subjects, approaches, and target populations. The Level II MTS projects are another resource that should be considered for dissemination along with the addition of new programs and projects such as those developed under the School-Based Grants program that meet pre-established criteria for state certification as model programs. The CTP should assist in the establishment of remote replication/ demonstration sites across the state to help disseminate practices and products validated by these projects.

7. *State-wide Technology Resources Clearinghouse and Database:* Establish a statewide centralized clearinghouse with a database of available promising practices, products, and model programs. Include a process to identify, describe, and disseminate staff development opportunities, promising technology applications, technology-based materials, relevant educational technology research and policy reports, distance learning resources, assessment information, and support services available to educators throughout California.

8. *State Video and Software Clearinghouses:* Provide to all educators access to software, video, and other technology-based resources that are matched and integrated with the California Curriculum Frameworks. The existing Software and Video Clearinghouses should be expanded (with additional funding) and more closely linked with existing curriculum and staff development resources, including the California Subject Matter Professional Development Projects, regional staff development agencies (SB 1882), County Offices of Education, the CTP, and schools of education across the state.

C. Regional Services to Schools

1. *Coordination of Regional Resources:* Regional support and dissemination resources to support school and district technology implementation should be significantly increased and more effectively coordinated between regional agencies including the CTP, ITV agencies, Model Technology Schools (Levels I and II), California Subject Matter Professional Development Projects, County Offices of Education, and SB 1882 regional staff development agencies. Consolidation of some services and/or financial incentives for agencies to collaborate or share resources should be considered.

2. *Regional Support:* Improve coordination and timely delivery of state and regional support services to schools to enhance technology use. Consider restructuring, consolidating, and coordinating some aspects of the regional support systems such as the CTP, ITV, regional SB 1882 staff development agencies, and schools of education. Review all available regional school support services for K-12 and post-secondary education to consider ways to interconnect agencies and optimize their efficiency in the support of technology use in all schools. Consider incentives to increase school/district commitment to using regional services and the Technology Resources in Education (TRIE) electronic information service and bulletin board.

3. *In-Depth Regional Staff Development of Teachers, Administrators and Paraprofessionals:* Provide for intensive curriculum-focused technology training institutes with the involvement of the CTP consortia, ITV agencies, Software Development Projects, Research and Development projects, and the Level I and II Model Technology School Projects. Expand the institutes to include a pre-service component for new teachers and an in-service component for instructors in public post-secondary institutions.

4. *Regional Resource Dissemination:* The dissemination of promising practices and products should be not only be continued but expanded. The success of the AB 803 Dissemination Projects and the Level II MTS Projects in producing a positive impact on the school level integration of technology into instruction has been well documented by this study. Educators consistently express a need to know about up-to-date practices and products in order to increase their use of technology.

5. *California Technology Project*: Continue to provide regional services determined by regions, schools, and districts to support technology use and integration into instruction. The CTP should be continued but with increased funding and support for the regional consortia. Each CTP council should review its membership to ensure that all major districts are represented and are actively involved in the decision making. Each council should include representation from the regional Staff Development Agencies (SB 1882), California Subject Matter Professional Development Projects, county offices of eduction, local business supporters, and teachers from both urban and rural districts. Annual needs assessment surveys to guide planning should be continued and the marketing of services shall be increased. Specific incentives should be considered to encourage schools and districts to join CTP consortia.

6. *Telecommunications:* Ensure that existing telecommunication systems are easily networked to each other to optimize access. Establish legislation and regulations to provide discounts to schools for the use of telecommunication and cable facilities. The CDE and the CSU system should continue to support the use of TRIE on CSUNet. Continued effort should be made to make the system more user friendly to educators with placement of more information on the system that is important to teachers and administrators. Additional schools need the equipment to access the system and the awareness and training to facilitate its use.

7. *Instructional Television Agencies*: The state should continue providing ITV services to schools, including information on available ITV programs, videotape distribution, training to integrate ITV into curriculum and instruction, support to county media directors for ITV use, and other services based on regional needs and state initiatives. The study suggests that the agencies should begin a phase-in process for restructuring services to increase equity of access to ITV services, expand to include other technologies such as multimedia and distance learning, provide closer coordination with other regional service providers, review and consolidate areas of duplication among agencies, and become integrated into the statewide educational technology master plan.

D. School and District-Level Resources

1. *School-Based Educational Technology Projects*: The study clearly indicated that funding and resources directed to school sites for the planned adoption, expansion, and development of educational technology projects to enhance curriculum and instruction should be continued. The program should continue special emphasis on school and classroom-specific Technology Use Plans, site-based staff development, curriculum integration, and emphasis on formative evaluation. Modifications of this program should

include expanding the timeframe for implementation beyond one year, increasing the base level of funding to increase the incentive for small schools to apply for grants, and increasing support for evaluation and identification of promising practices and projects.

2. *Staff Development, Planning and Evaluation:* The study shows that staff development and teacher-involvement in the planning, implementation, and evaluation of projects significantly contributed to successful implementation but that sufficient time and resources for these activities were often not allocated. At least 15% of the project budget should be allocated for staff development with an additional 15% allocated for project planning, implementation, and evaluation.

3. *Technology Access to Students with Special Educational Needs:* The study showed that programs such as special education, adult education, bilingual education, and vocational education were not often directly involved as recipients of educational technology project resources. New guidelines should directly address providing access of these programs to technology resources.

4. *Matching Grants and Partnerships:* A major emphasis for all school/district-based programs should be the leveraging of resources and funding from educational agencies, business and industry, foundations, and other community sources. Matching of state project funding should not be less than 20 percent of the total amount of state funding. All new projects that receive the direct benefits of state funding should be required to periodically document matching support. Another approach might be to award extra points in the scoring of proposals based on levels of matching funding allocated by the local educational agency. Project planning should include documentation that efforts were made to obtain partnerships and outside support in the development of the proposal.

   NOTE: In-kind matching should include all local resources used to support the project. Legislation should define in-kind to include state and categorical funds such as SIP and SB 1882 School Development Plans. Schools/districts should be encouraged to use Chapter I and II funds for technology as appropriate in concert with their technology use plans.

5. *Group-buy of Technology-Based Materials:* Consideration should be given to carefully planned large scale purchase and distribution of equipment to schools if it can be determined that such distributions are cost-effective and will significantly stimulate expanded utilization of technology to increase teaching and learning opportunities.

6. *School/District Incentives for Technology Use Resources:* The study suggests a need to provide incentives for schools and districts to seek out and utilize services that are already available. A new approach might be to provide technology use support service entitlements that could be expended only for regional support services from the CTP, ITV Agencies, or other designated services related to the development and implementation of integrated educational technology projects and programs.

7. *Competitive vs. Entitlement Grants for Educational Technology Projects:* Continue the policy of allocating funding through a competitive process for school and district level projects. The study clearly showed that, while the development of the proposals created a burden, the competitive process stimulated careful planning, with documentation along with targeted use of project funding resources to meet state and locally-established needs and priorities. It is often found that entitlements and block grants used for technology (or other special projects) do not result in local changes that can be documented. Additionally, with limited state funding, entitlements to all schools would not provide enough funding at any particular site to implement a program or project.